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ABSTRACT

This bibliography contains works that illustrate and apply multivariate statistical methods in the analysis of empirical data in the field of urban and regional planning. The bibliography has been designed for use by planning students and the professional planner. The first section of the bibliography lists some elementary and intermediate level textbooks. These provide an introduction to statistics for the reader who is unfamiliar with the concepts that are discussed in the later sections. The remaining items are classified by method of analysis. When considered relevant, a brief annotation has been appended to the citation. (Author/DN)

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APPLICATION OF MULTIVARIATE STATISTICAL METHODS TO URBAN AND REGIONAL PLANNING

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INTRODUCTION:

Traditionally economists, psychologists and educators have applied multivariate statistical methods to analyse empirical data. More recently, geographers and planners have been applying these methods to analyse city and regional data.

The non-mathematician can best learn these methods by repeated exposure to applications and illustrations in his own field. In fact, some of the theoretical developments in areas such as factor analysis have come from the applied social scientist who encountered problems with the interpretation of the empirical results of his particular problem.

It is with this point in mind that this bibliography is being made available to the planning student and professional. It was originally prepared for my class on Advanced Statistical Methods in Planning at the University of British Columbia. I am deeply indebted to my students for helping me in the process of weeding out material that was incomprehensible, irrelevant, or only marginally useful. I am especially indebted to Miss Shueng-Ling Chan for her research assistance in updating this bibliography. I am also grateful to Professor Shue Tuck Wong, of Simon Fraser University for bringing some items to my attention that helped round off the more skimpy sections.

The first section of the bibliography lists some textbooks of statistics at the elementary and intermediate level. These provide the introduction to elementary statistics to the reader who is unfamiliar with the concepts that are discussed in the later sections.

The items listed are classified by method of analysis. When considered relevant, a brief annotation is appended to the item listed. When a reference uses more than one method, it is repeated under all the relevant sections.

In a rapidly evolving interdisciplinary area such as the one under consideration, literature is scattered in a wide variety of journals. The bibliography attempts to cover the various substantive fields of planning like urban structure, recreation, and transportation. However, some fields have many more illustrations of the uses of a technique than others. The use of factor analysis extensively in studies of urban structure and ecology is one such example.

I. TEXTBOOKS ON ELEMENTARY STATISTICS WITH SOCIAL SCIENCE ILLUSTRATIONS:

Blalock, H.M. Social Statistics. New York: McGraw-Hill, 1960.

A verbose, but non-mathematical elementary textbook with socio-logical examples.

Fruend, John E. Modern Elementary Statistics. New Jersey: Prentice-Hall, 1967, Third Edition.

Concise, clear, but more mathematical than Blalock referred to above.

Moroney, M.J. Facts from Figures. Harmondsworth: Penguin, 1956. (Paperback).

Wallis, W.A. and H.V. Roberts. Statistics: A New Approach. New York: Free Press, 1956.

II. TEXTBOOKS ON INTERMEDIATE STATISTICS FOR THE SOCIAL SCIENTIST:

Dixon, W.J. and F.J. Massey, Jr. Introduction to Statistical Analysis. New York: McGraw-Hill, 1957.

Quinn McNemar. Psychological Statistics. New York: John Wiley, 1965.

Somewhat mathematical, but good source of explanation on certain tests (x^2, Analysis of variance) and interpretation.

Walker, H.M. and J. Lev. Statistical Inference. New York: Holt, Rinehart and Winston, 1953.

Provides an excellent explanation of two way analysis of variance.

Wallis. W.A. and H.V. Roberts. The Nature of Statistics. New York: Collier, 1962 (Paperback).

III. TEXTBOOKS AND ARTICLES ON MULTIVARIATE METHODS:

Berry, B.J.L. and Duane Marble. Spatial Analysis: A Reader in Statistical Geography. New Jersey: Prentice-Hall, 1969.

Collection of journal articles in geography using several multivariate methods. Urban geographic examples of special interest to planners.

Bishop, D.W. "Some Multivariate Analysis Techniques and Their Approaches and Recreation Research." Recreation Research, National Conference on Recreation Research, 1965. University Park, Pa. pp. 177-193.

Cooley, W.W. and Lohnes, P.R. Multivariate Procedures for the Behavioural Sciences. New York: John Wiley, 1962. (New edition forthcoming in 1970).

A basic reference though not always detailed and clear. Fortran programmes and subroutines for multivariate procedures are provided.

Haggett, Peter. Locational Analysis in Human Geography. London: Edward Arnold, 1965.

King, Leslie. Statistical Analysis in Geography. New Jersey: Prentice-Hall, 1969.

All multivariate methods are presented. The sections on discriminant analysis and canonical correlations are especially useful.

Morrison, D.F. Multivariate Statistical Methods. New York: McGraw-Hill, 1967.

A highly mathematical textbook.

Rulon, Phillip J. et al. Multivariate Statistics for Personnel Classification. New York: John Wiley, 1967.

A detailed clear explanation of regression and discriminant analysis. The book also provides the intermediate level reader with explanation concepts like standard scores and the statistical and interpretative aspects of various matrices associated with multivariate methods.

Sokal and Sneath. Principles of Numerical Taxonomy. Freeman, 1963.

Veldman, Donald J. Fortran Programming for the Behavioural Sciences. Holt, Rinehart and Winston.

Somewhat more elementary than Cooley and Lohnes, but more verbose and not necessarily better. Combines statistics and Fortran programmes.

IV. CHI-SQUARED AND CONTINGENCY COEFFICIENTS:

Bell, Wendell and Marion D. Boat. "Urban Neighbourhoods and Informal Social Relations." American Journal of Sociology, 1956. pp. 391-398.

Burch, William R. "The Social Circles of Leisure: Competing Explanations." Journal of Leisure Research, Vol. 1, No. 2, Spring, 1969. The National Recreation and Park Association. pp. 125-148.

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Clyde, W.R. "Social Class Differences in the Uses of Leisure." American Journal of Sociology, Vol. 61, (1955-56), 145-150.

Greer, Scott. "Urbanism Reconsidered: A Comparative Study of Local Areas in a Metropolis." American Sociological Review, Vol. 21, 1955.

Harry, Joseph; Richard Gale and John Hindle. "Conservation: An Upper-Middle Class Social Movement." Journal of Leisure Research, Vol. 1, No. 3, Summer, 1969. The National Recreation and Park Association. pp. 246-254.

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Peterson, George L. and E.S. Neumann. "Modelling and Predicting Human Response to the Visual Recreation Environment." Journal of Leisure Research, Vol. 1, No. 3, Summer, 1969. The National Recreation and Park Association. pp. 219-237.

Wabe, J.S. "Office Decentralisation: An Empirical Study." Urban Studies, Vol. 3, No. 1, February, 1966. pp. 35-55.

Wachs, Martin. "A Survey of Citizen's Opinions of the Effectiveness, Needs and Techniques of Urban Transportation Planning." Highway Research Board, #229, N.R.C. Washington, D. C.

V. ANALYSIS OF VARIANCE AND COVARIANCE

Murdie, Robert A. Factorial Ecology of Metropolitan Toronto, 1951-61: An Essay on the Social Geography of the City. Research Paper #116. Chicago, Illinois: University of Chicago, Department of Geography, 1969.

Ray, D. Michael et al. The Socio Economic Dimensions and Social Structure of Canadian Cities. Unpublished Paper. University of Waterloo, 1968.

Tilly, Charles. "Occupational Rank and Grade of Residence." American Journal of Sociology, Vol. 67. pp. 323-330.

VI. SIMPLE AND MULTIPLE REGRESSION

Balkus, Kozmas and J. David Jordan. "Regression Model for Projecting Vehicle-Miles of Travel in a Metropolitan Region." Highway Research Record, No. 250, 1968. pp. 25-34.

Berry, B.J.L.; H. Gardiner Barnum, and Robert S. Tenant. "Retail Location and Consumer Behaviour." Papers and Proceedings of Regional Science Association, Vol. 9, 1962. pp. 65-106.

Beshers, James et al. "Ethnic Congregation Segregation, Assimilation and Stratification." Social Forces, May, 1964. pp. 482-489.

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Bourne, Larry S. Private Redevelopment of the Central City. Department of Geography, Research Paper #112. Chicago, Illinois: University of Chicago, 1967.

Chan, Ling. Multicollinearily in Transportation Models. M.A. Thesis. University of British Columbia (in progress).

Crecine, John P. et al. "Urban Property Markets: Some Empirical Results and Their Implications for Municipal Zoning." Journal of Law and Economics, Vol. X, October, 1967. pp. 79-100.

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Kaiser, Edward et al. "Predicting the Behaviour of Predevelopment Landowners on the Urban Fringe." Journal of the American Institute of Planners, September, 1968. pp. 328-335.

King, Leslie. "Cross Sectional Analysis of Canadian Urban Dimensions." Canadian Geographer, Vol. 10, 1966. pp. 205-224.

Rao, C.R. Advanced Statistical Methods for Biometric Research. New York: John Wiley, 1952.

An excellent explanation of Discriminant Analysis.

Rulon et al. Multivariate Statistics for Personnel Classification. New York: John Wiley, 1967. pp. 299-320.

XI. CANONICAL CORRELATION:

Berry, B.J.L. Essays on Commodity Flows and the Spatial Structure of Indian Economy. pp. 199-201, 254-255 (results).

Berry's treatment of the technique is very sketchy here. The work itself is one of the few applications of this technique in planning.

Cooley and Lohnes, op. cit. pp. 35-37, 40-45.

A reasonably good exposition.

Horst, Paul. "Relations Among M Sets of Variates." Psychometrika, Vol. 26, 129-149.

Non-planning exposition. Mathematical.

Tintner, G. "Some Applications of Multivariate Analysis to Economic Data." Journal of American Stat. Association, Vol. 41 (1946) pp. 472-474 (including "notation") 485-489.

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Tintner's worked example is unique--it suggests the possibility of using Canonical Correlations for construction of "indexes", e.g., price index, or say, "Housing Quality index", etc., etc.

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TO URBAN AND REGIONAL PLANNING

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